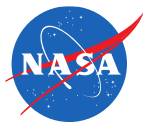




Orbit Determination Adaptations for the Cassini Grand Finale

Zahi Tarzi, Julie Bellerose, Duane Roth
Rodica Ionasescu, Dylan Boone, Kevin Criddle

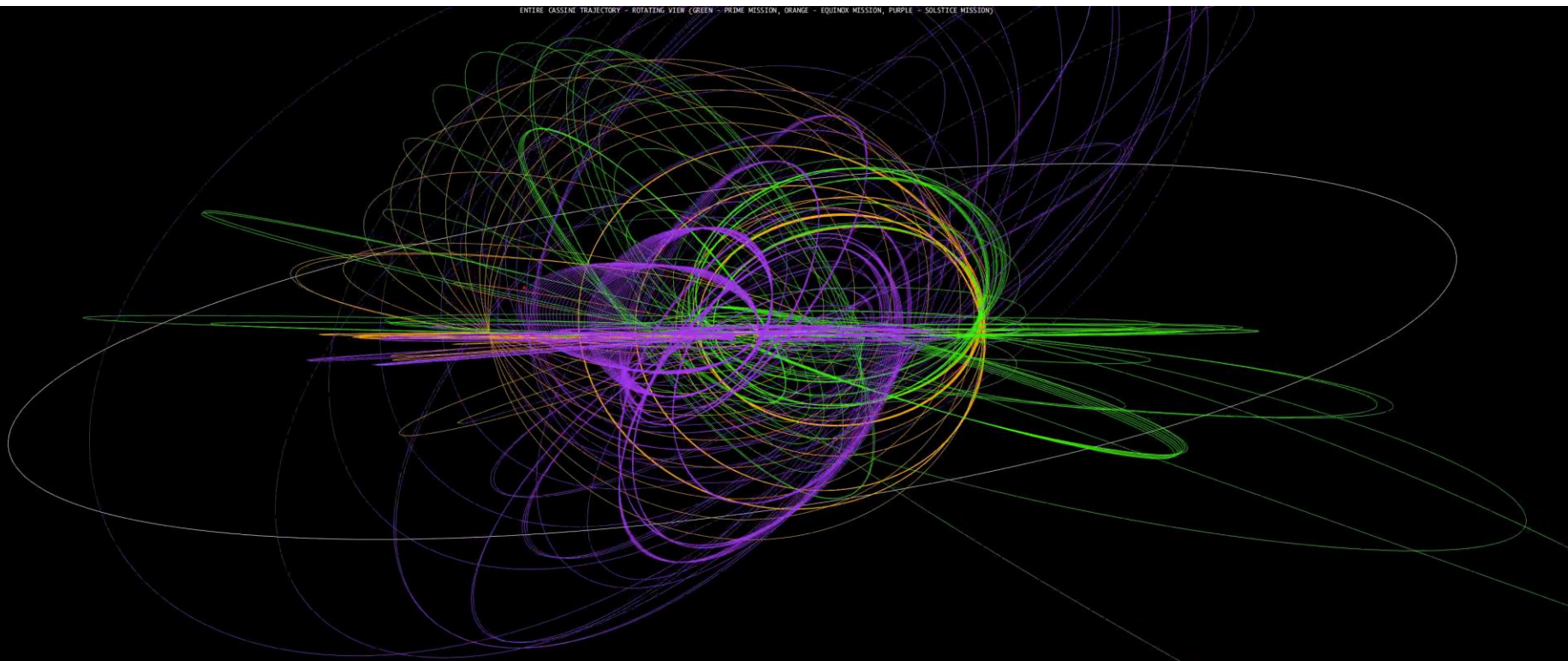


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June 4-9, 2017 Matsuyama, Japan

Thirteen Years of Operations at Saturn

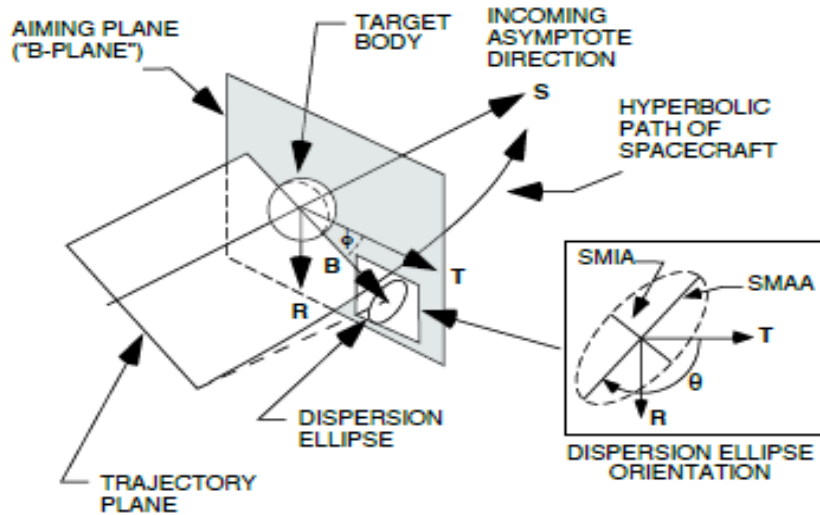
- 1997 – Launch
- 2004 – Arrival at Saturn
- 2017 – Grand Finale
- 292 revolutions around Saturn
- 126 encounters with Titan
- 22 encounters with Enceladus



Prime Mission (2004-2008) - Equinox Mission (2008-2010) - Solstice Mission (2010-2017)

Mapping to the B-Plane

Satellite Encounter

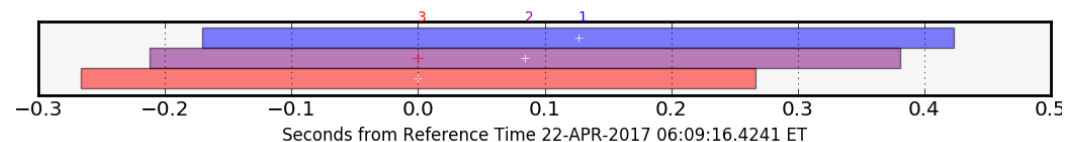
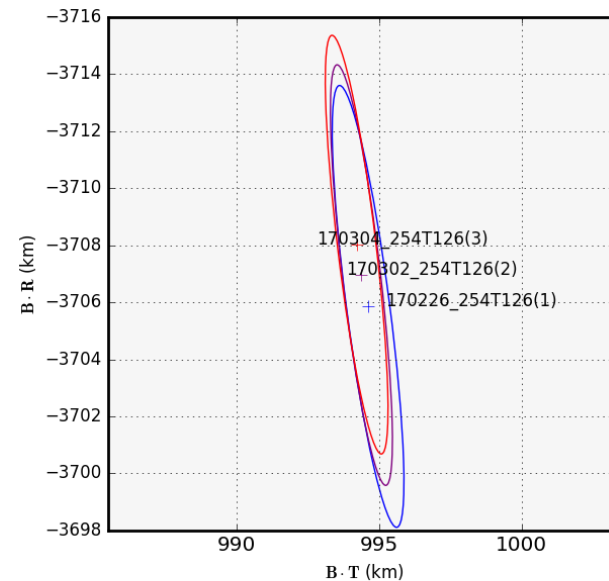


Navigation is divided into “arcs” anchored by initial and final encounters.

Maneuvers targeted B-plane position and time of the next encounter.

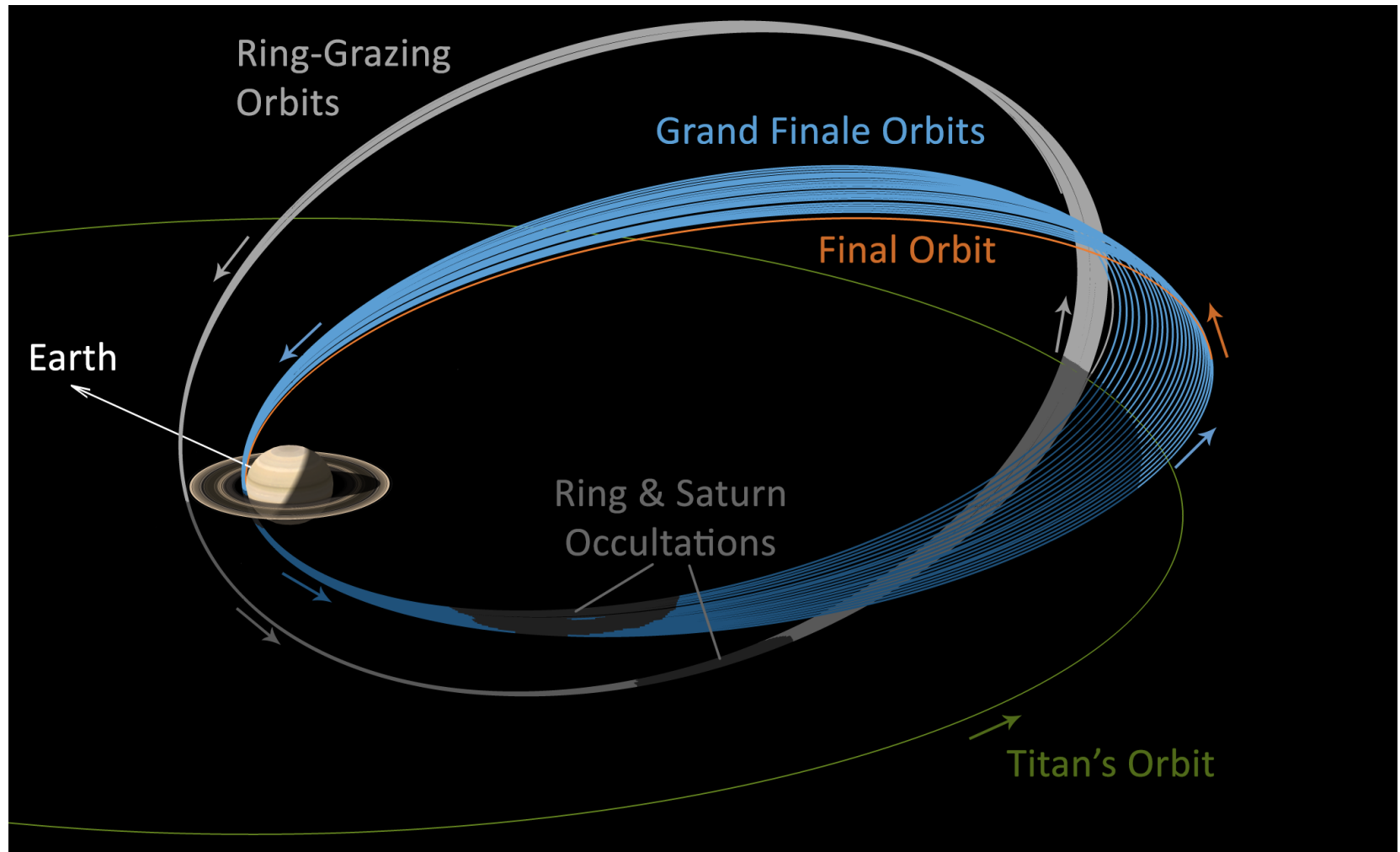
Uncertainties were mapped to B-plane.

T-126 Encounter B-Plane



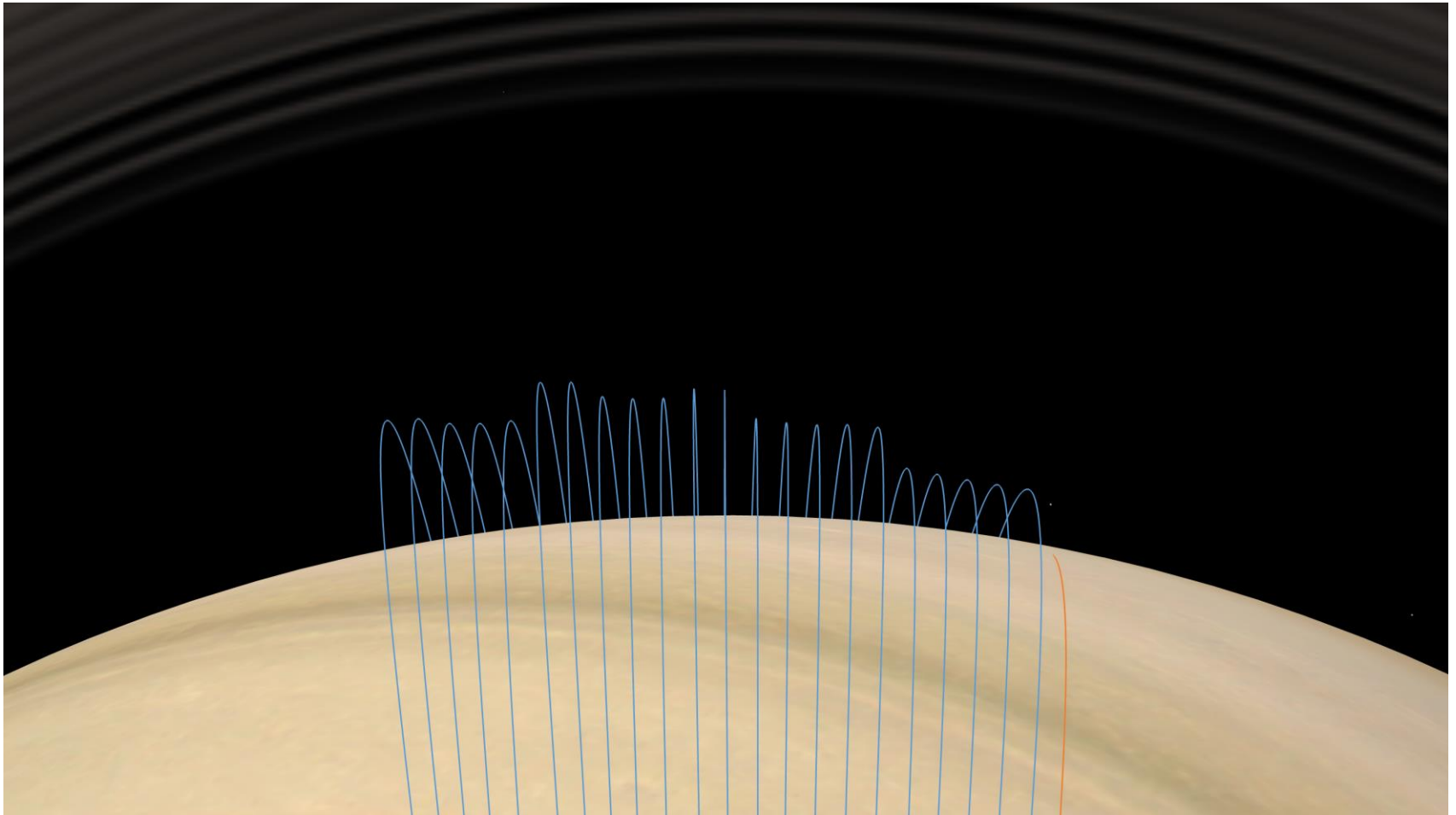
Cassini Grand Finale

Overview



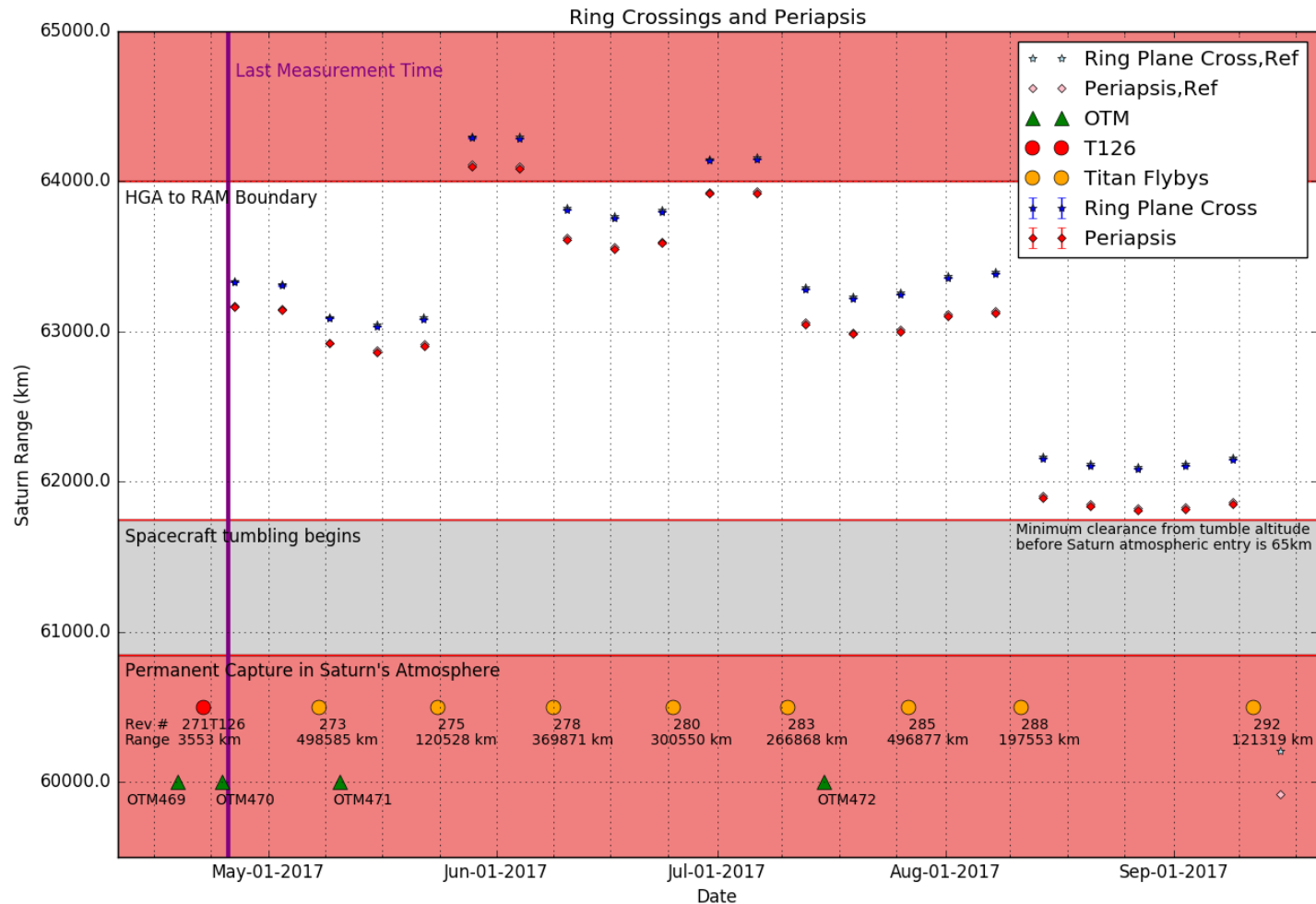
Grand Finale Orbits

Periapsis



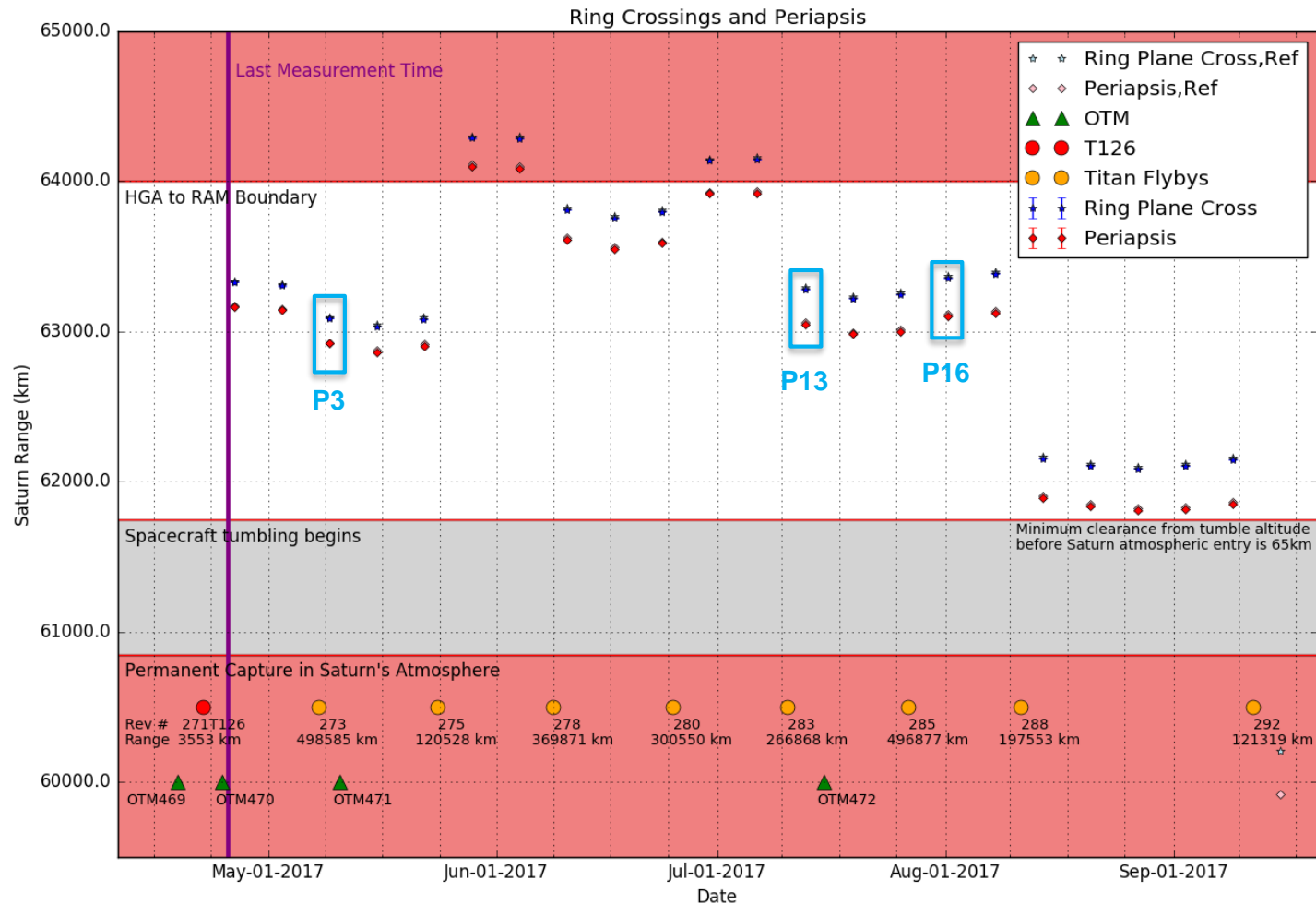
Grand Finale Periapsis and Ring Crossings

Saturn Range Values



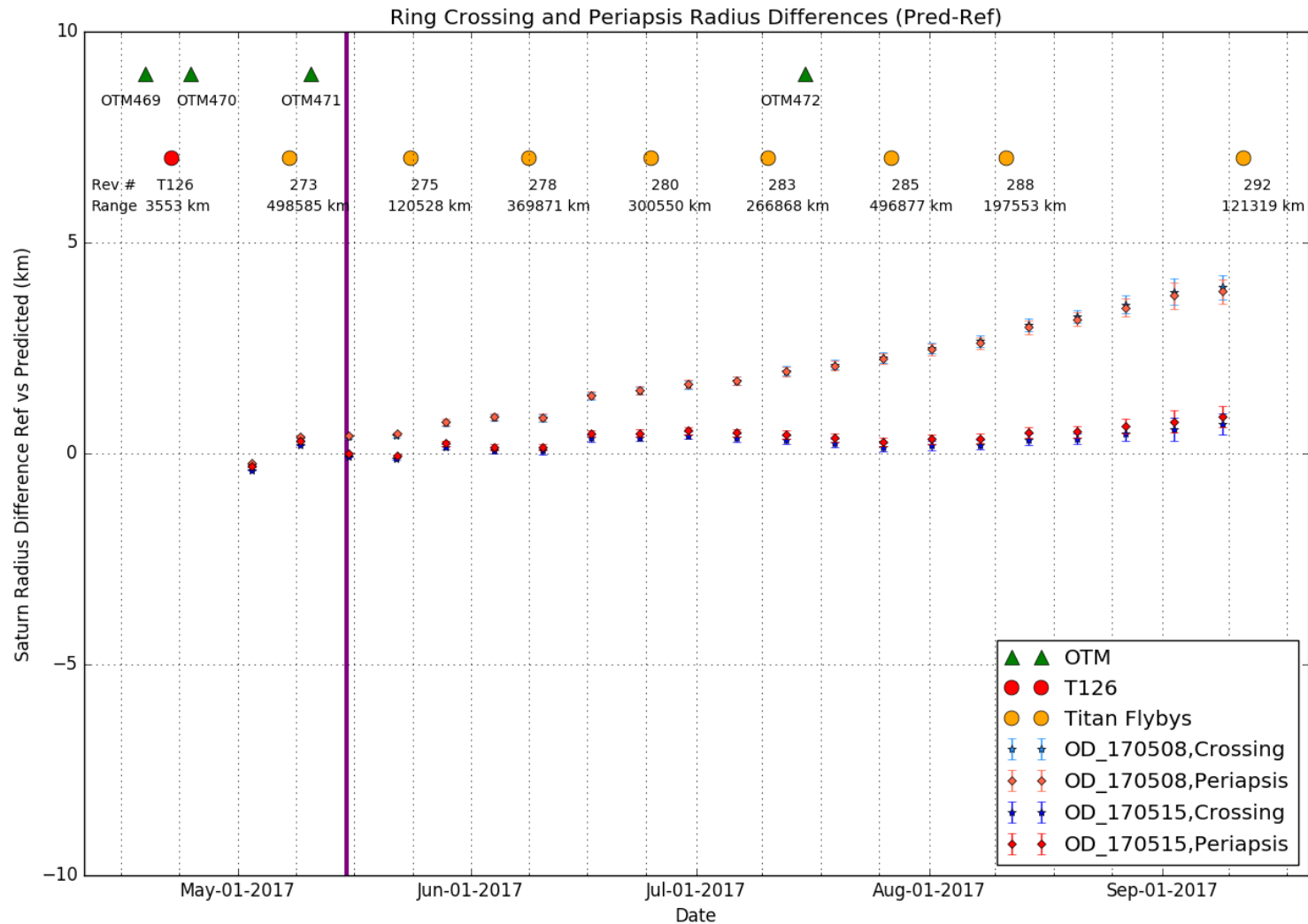
Grand Finale Periapsis and Ring Crossings

Saturn Range Values



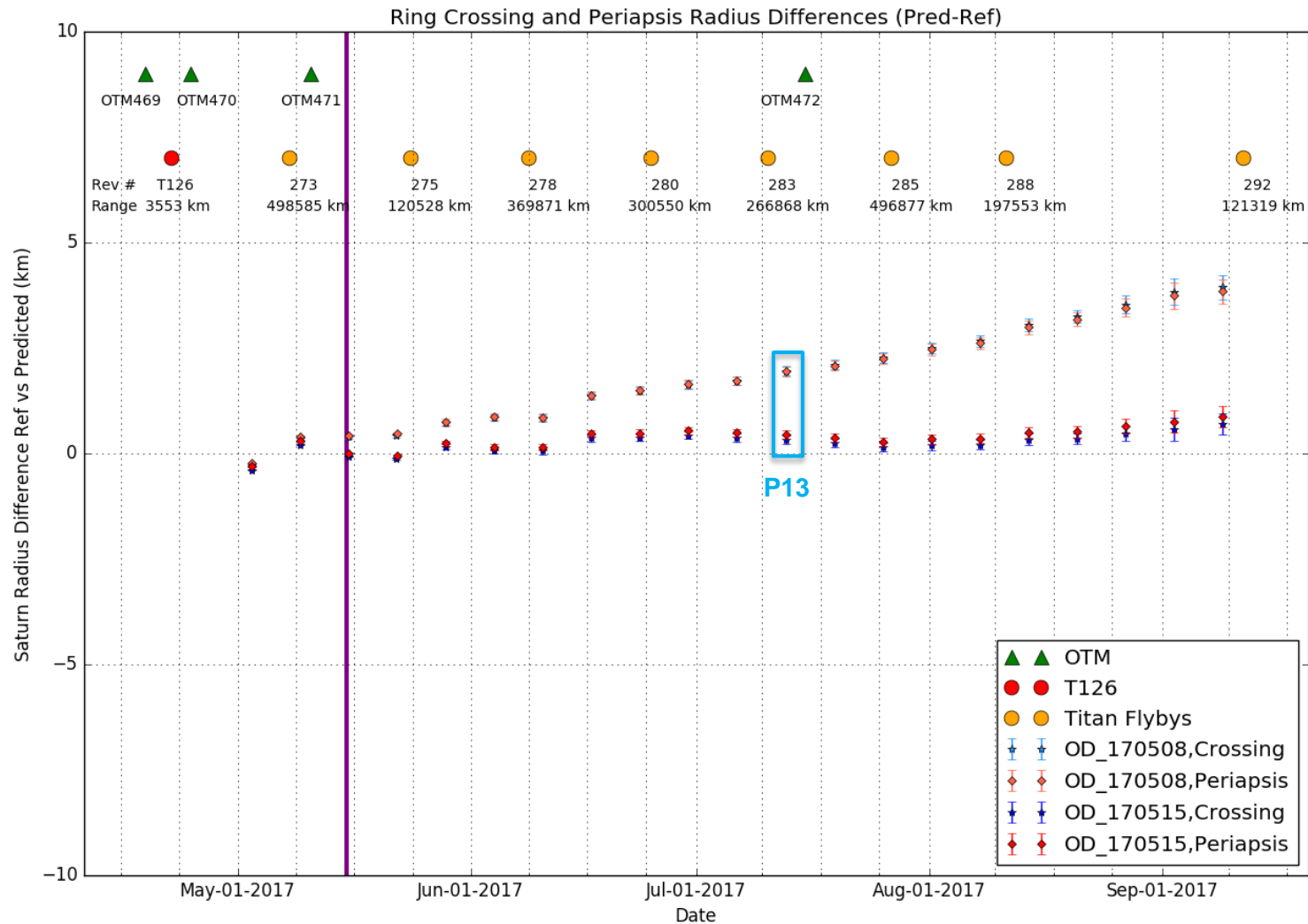
Ring Plane Crossing and Periapsis

Radial Difference from Reference



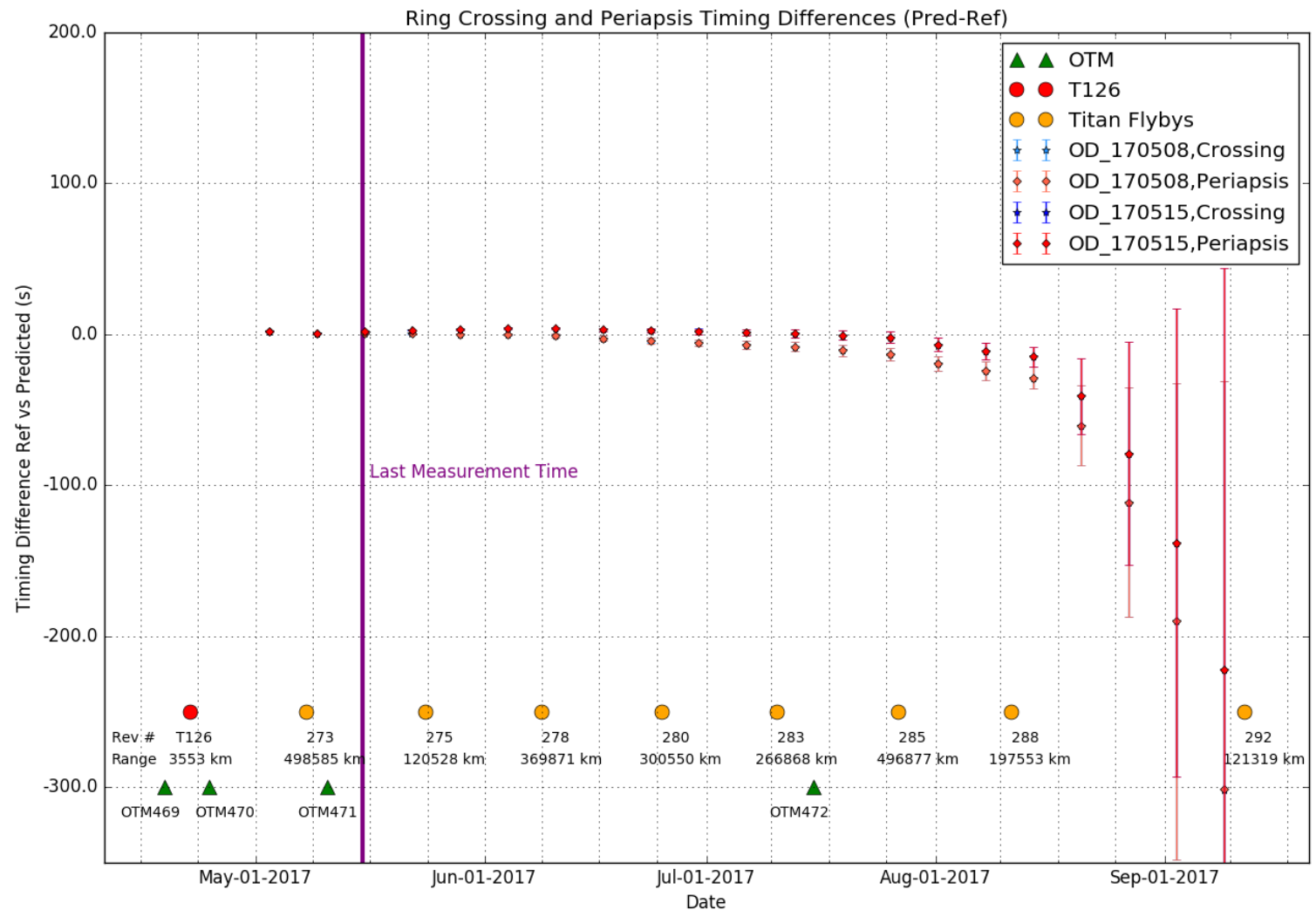
Ring Plane Crossing and Periapsis

Radial Difference from Reference



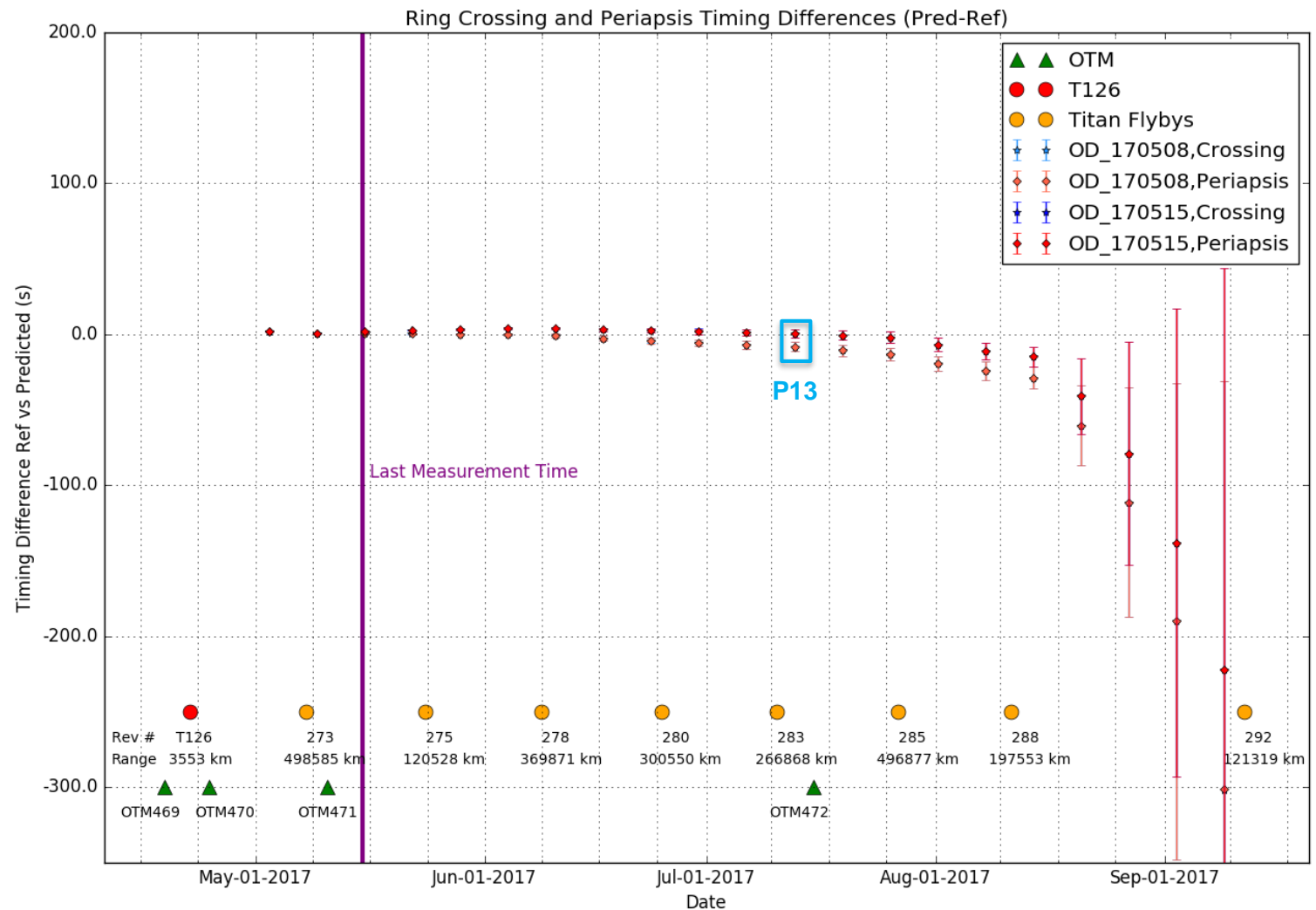
Ring Plane Crossing and Periapsis

Timing Difference from Reference



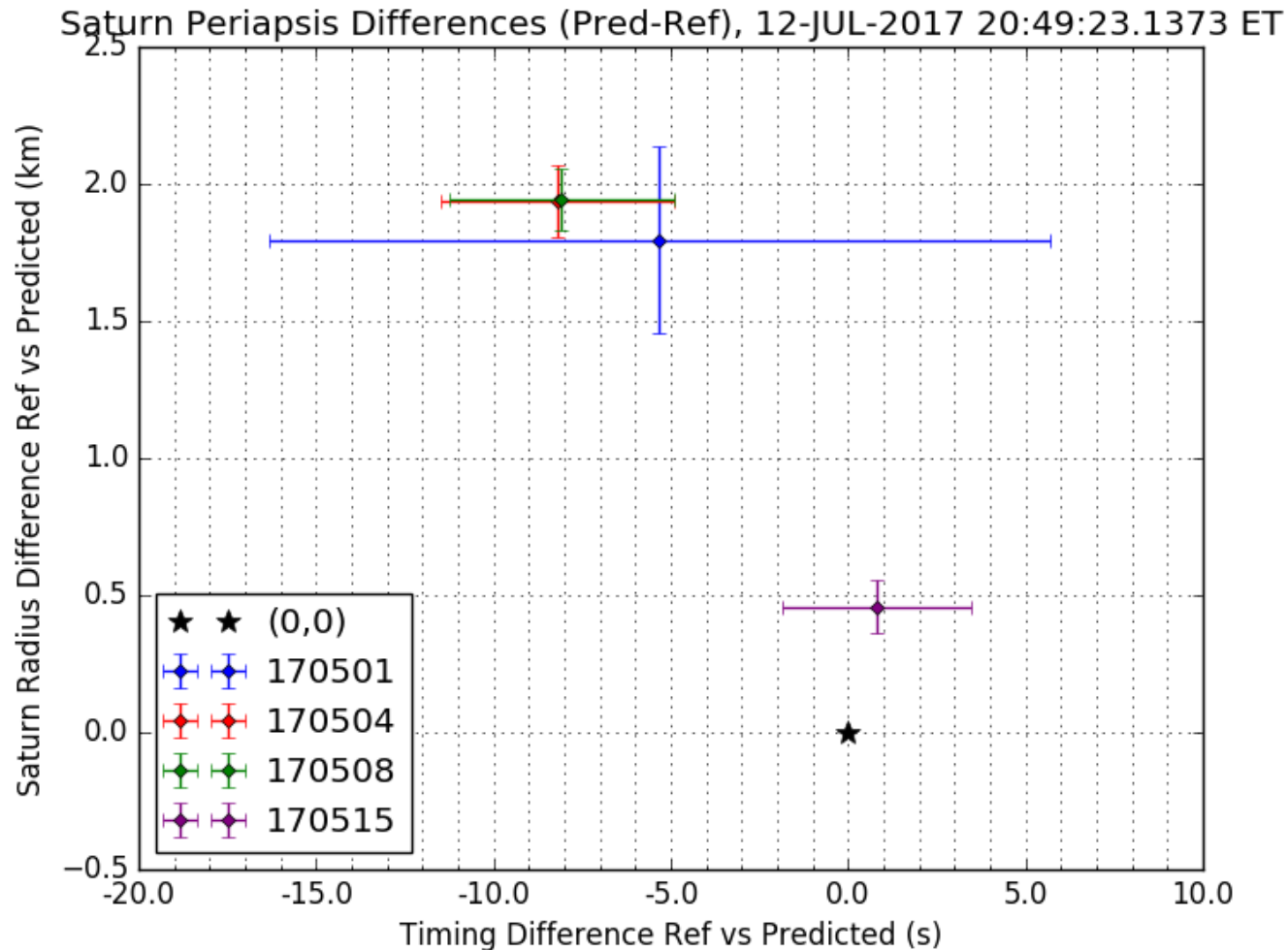
Ring Plane Crossing and Periapsis

Timing Difference from Reference



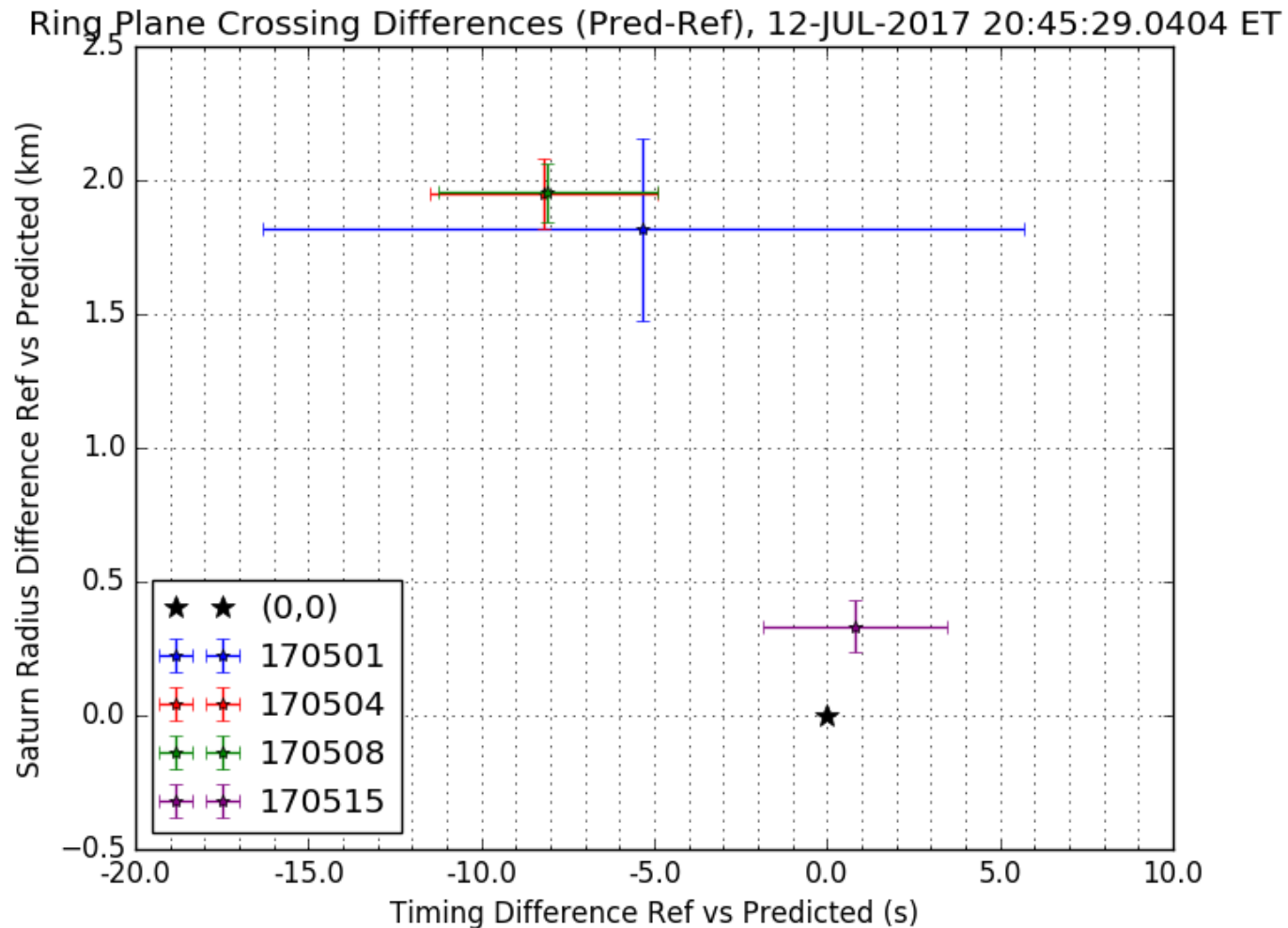
Saturn Periapsis 13

Radial and Timing Difference from Reference



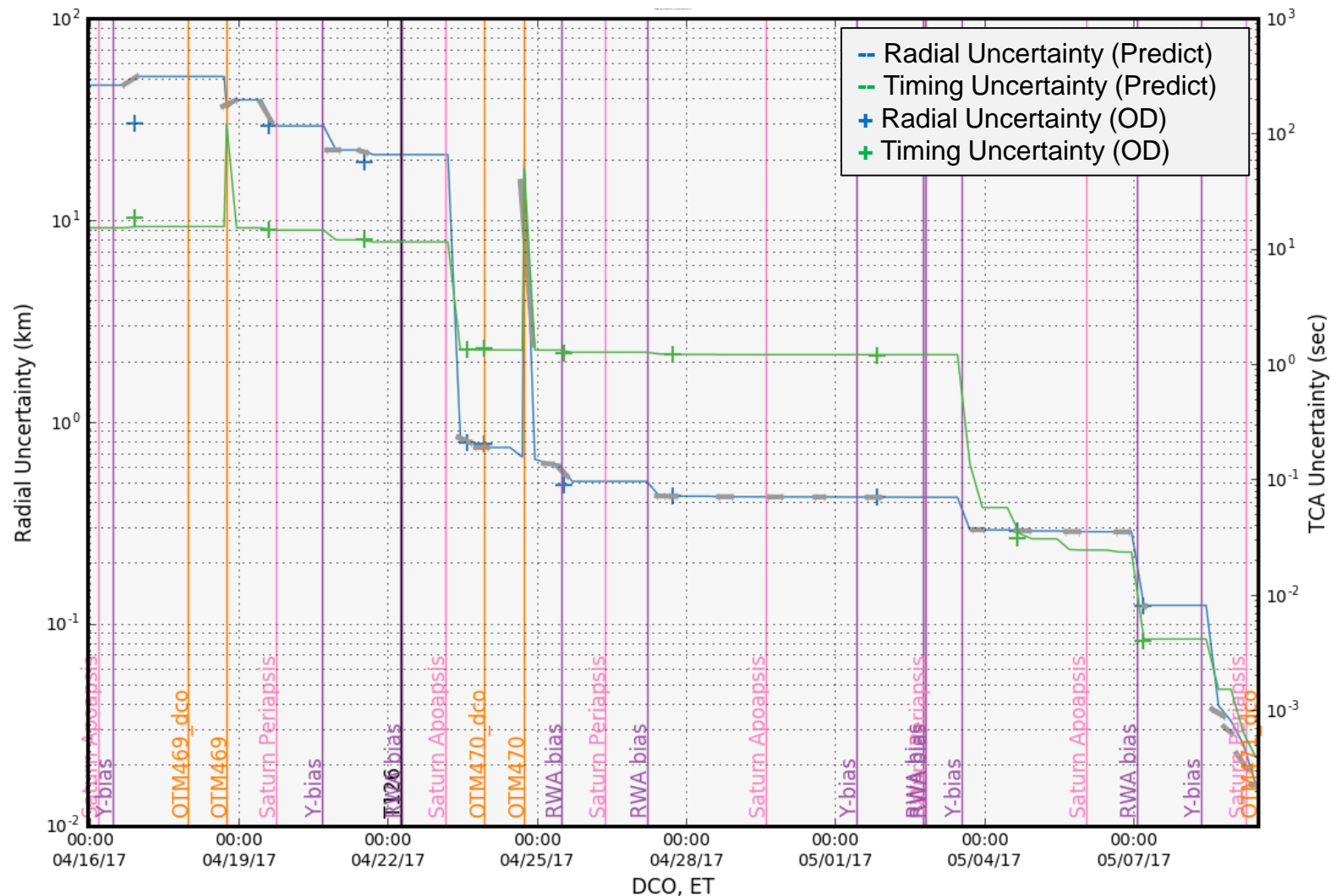
Ring Plane Crossing 13

Radial and Timing Difference from Reference



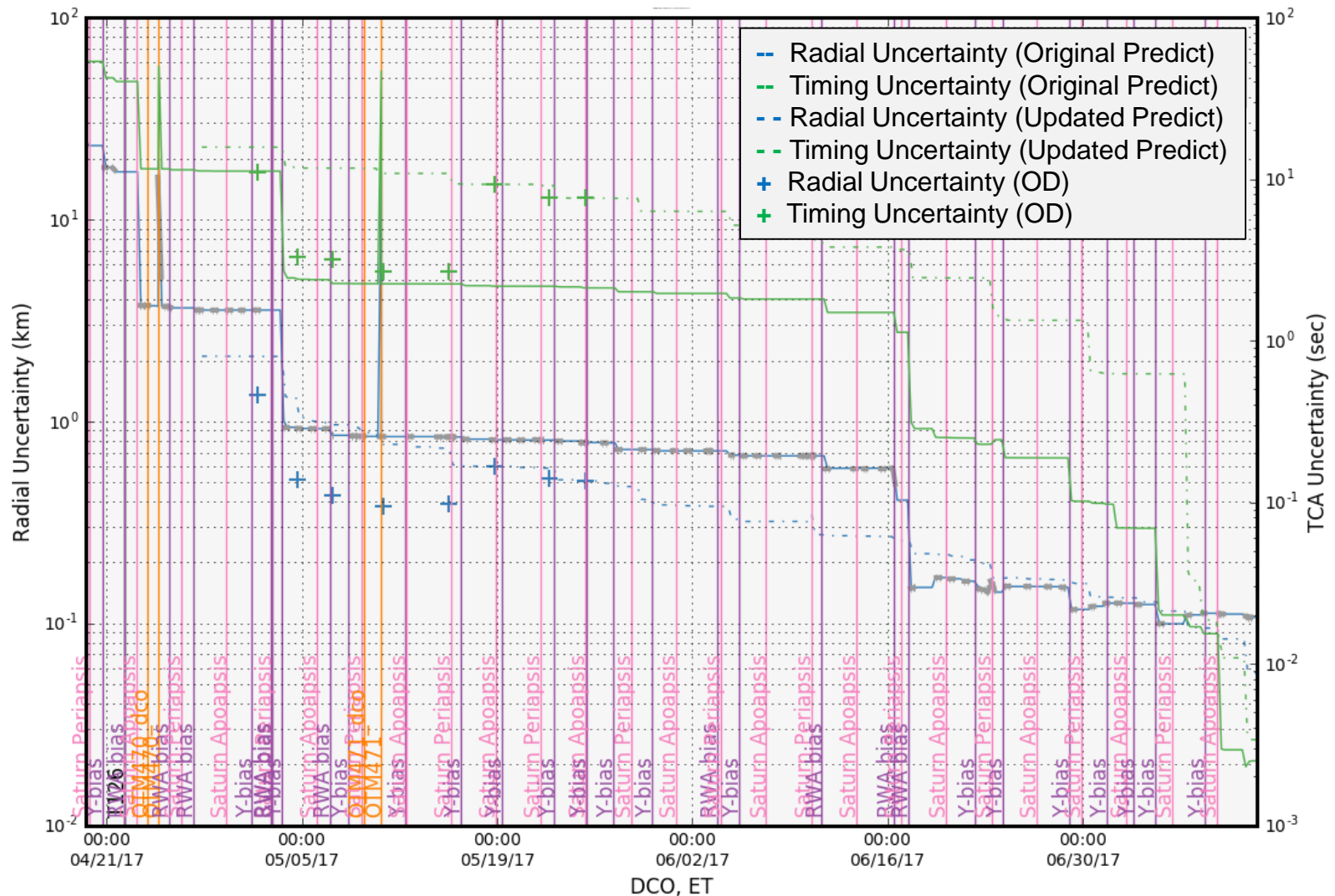
Timing and Radial Uncertainties

Mapped to OTM470 Target: Periapsis 03 (+2 hours)



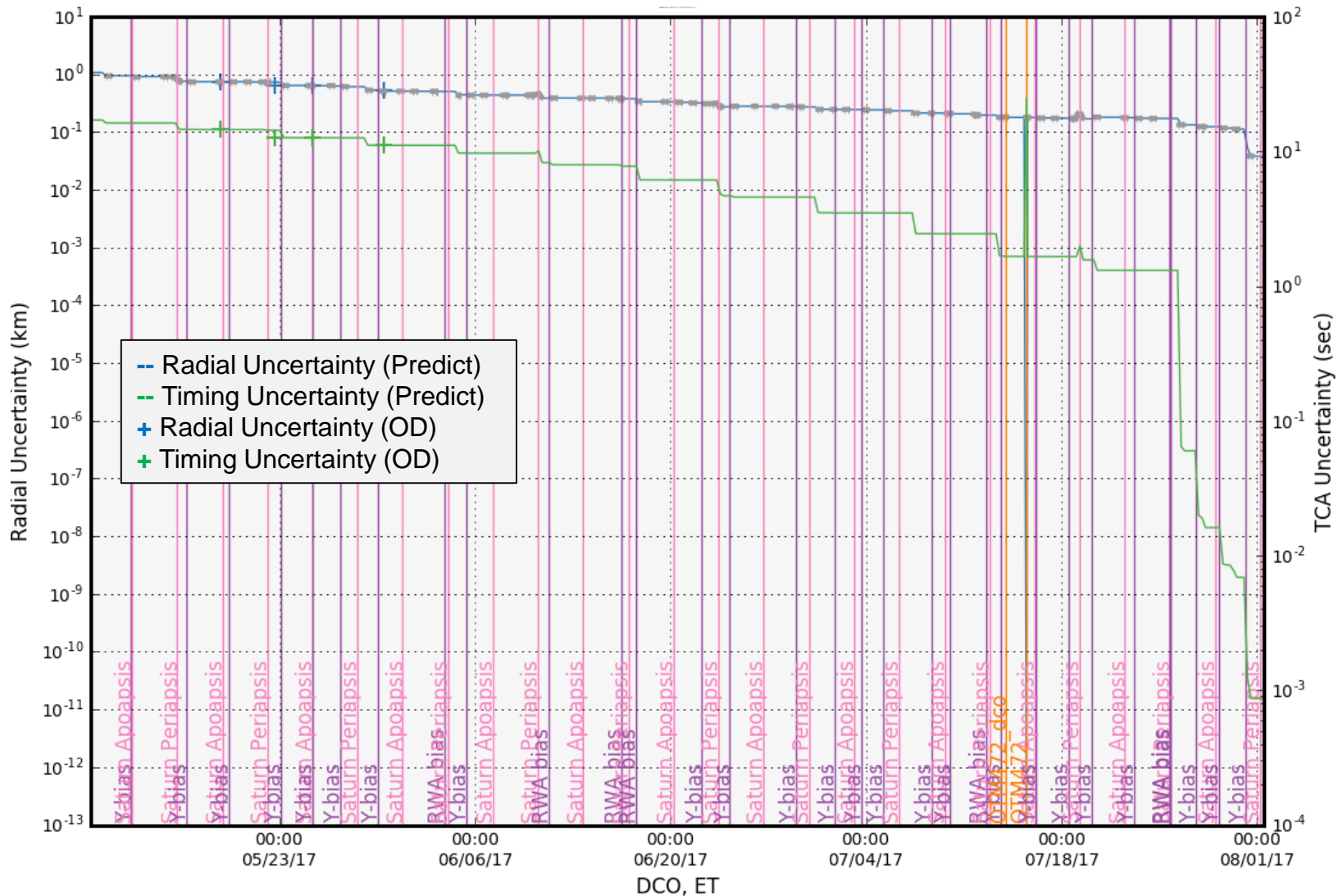
Timing and Radial Uncertainties

Mapped to OTM471 Target: Periapsis 13 (+2 hours)



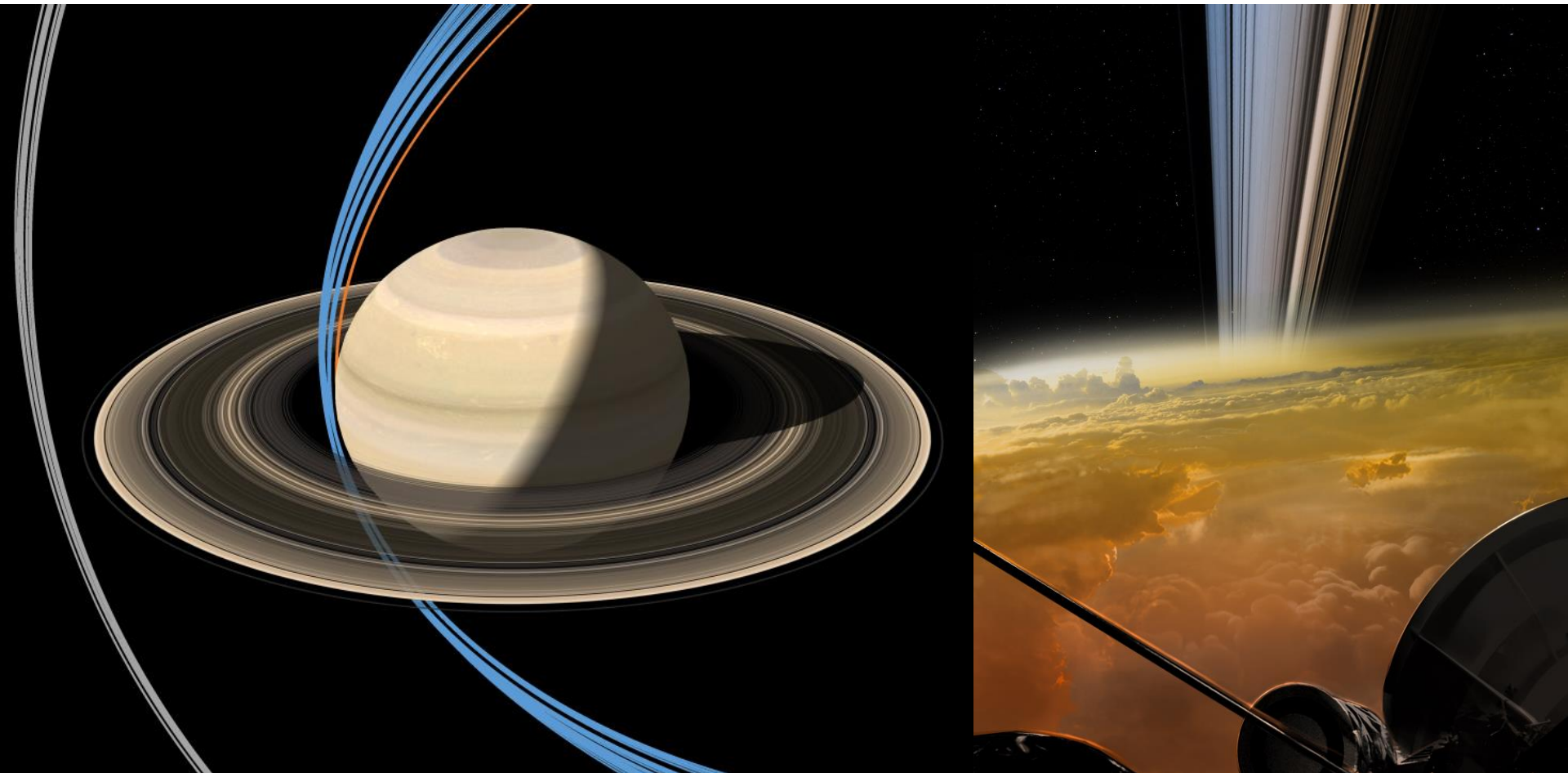
Mapped to OTM472 Target: Periapsis 16 (+2 hours)

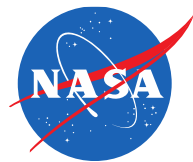
Mapped to OTM472 Target: Periapsis 16 (+2 hours)



Conclusion

September 15, 2017 (~10:45 UTC)





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